

CLAIMS

What is claimed is:

1. A lossless encoding and/or decoding system for converting input data in real time, comprising:
 - an input buffer to store an input one of audio data and encoded audio data,
 - a lossless conversion unit to losslessly convert the stored input one data stored in the input buffer in units of predetermined data and to output converted data in sequence, the converted data being the other one of the audio data and the encoded audio data,
 - an output buffer to store the converted data output from the lossless conversion unit, and to output the other one of the audio data and the encoded audio data, and
 - a bitrate controller to control the encoded data stored in one of the input and output buffers, so as to:
 - distinguish each predetermined data unit of the converted data stored in the one of the input and output buffers as first data having a data amount exceeding a maximum bitrate or second data having a data amount less than the maximum bitrate,
 - categorize the first data as third data being the encoded audio data having a data amount of the maximum bitrate and fourth data being the encoded audio data of a portion of the first data exceeding the maximum bitrate,
 - use identification information corresponding to the third data and fourth data to indicate which of the third data and fourth data are from the same predetermined data units, and
 - control the one of the first and second buffers so that, in order to output a bitstream of the encoded data at or below the maximum bit rate, the fourth data is output together with the second data from the one of the input and output buffers and the second through fourth data are output as the bitstream, or, in order to output the bitstream at above the maximum bit rate to be supplied to the lossless converter, the second data is supplied to the lossless converter and the third data and fourth data having the same identification information are combined and supplied to the lossless converter.
2. The lossless encoding and/or decoding system according to claim 1, wherein the bitrate controller determines the maximum bitrate based upon a bitrate resulting from the

lossless compression encoding of all of an amount of the input audio data on an audio track of a recording medium.

3. The lossless encoding and/or decoding system according to claim 1, wherein, in order to output a bitstream of the encoded data at or below the maximum bit rate, the one of the input and output buffers sequentially outputs the encoded audio data stored according to the bitrate controller at an output bitrate which is less than or equal to the maximum bitrate.

4. The lossless encoding and/or decoding system according to claim 1, wherein the predetermined data units are frames, and, in order to output a bitstream of the encoded data at or below the maximum bit rate, the bitrate controller adds the fourth data of a first one of the frames to a second frame of the second data preceding the first frame of the fourth data.

5. The lossless encoding and/or decoding system according to claim 4, wherein the bitrate controller determines whether the fourth data of the first frame and the second data of the second frame combined exceeds the maximum bitrate prior to adding the fourth data of the first frame with the second data of the second frame.

6. The lossless encoding and/or decoding system according to claim 1, wherein:
the input one of the audio data and the encoded audio data comprises the audio data,
the lossless conversion unit comprises a lossless compression unit to losslessly
compression encode the audio data in the input buffer in units of the predetermined data and to
output the encoded audio data in the sequence, and

the bitrate controller to distinguish each predetermined data unit of the encoded audio data stored in the output buffer as the first data having the data amount exceeding the maximum bitrate or second data having a data amount less than the maximum bitrate, divides the first data into third data being the encoded audio data having a data amount of the maximum bitrate and fourth data being the encoded audio data of a portion of the first data exceeding the maximum bitrate, adds identification information to the third data and fourth data to indicate which of the third data and fourth data are from the same predetermined data units, and controls the first output buffer so that the fourth data is output together with the second data from the first output buffer, and the second through fourth data are output as a bitstream,

and

the lossless encoding and/or decoding system further comprises a lossless restorer to losslessly restore a received bitstream.

7. The lossless encoding and/or decoding system according to claim 6, wherein the received bitstream is comprises other audio data processed in real time according to the following method:

losslessly compression encoding the other audio data in a corresponding sequence;
determining whether predetermined data units of the encoded other audio data have data amounts in excess of the maximum bitrate; and

combining the excessive data amounts with data amounts of ones of the predetermined data units which are less than the maximum bitrate.

8. The lossless encoding and/or decoding system according to claim 6, wherein the bitrate controller determines the maximum bitrate based upon a bitrate resulting from the lossless compression encoding of all of an amount of the input audio data on an audio track of a recording medium.

9. The lossless encoding and/or decoding system according to claim 6, wherein the first output buffer sequentially outputs the encoded audio data stored according to the bitrate controller at an output bitrate which is less than or equal to the maximum bitrate.

10. The lossless encoding and/or decoding system according to claim 6, wherein the predetermined data units are frames, and the bitrate controller adds the fourth data of a first one of the frames to a second frame of the second data preceding the first frame of the fourth data.

11. The lossless encoding and/or decoding system according to claim 10, wherein the bitrate controller determines whether the fourth data of the first frame and the second data of the second frame combined exceeds the maximum bitrate prior to adding the fourth data of the first frame with the second data of the second frame.

12. The lossless encoding and/or decoding system according to claim 1, wherein:
the input one of the audio data and the encoded audio data comprises the encoded audio data,

the lossless conversion unit comprises a restorer to losslessly restore a received bitstream comprising the encoded audio data stored in the input buffer in units of the predetermined data and to output the audio data in the sequence,

a buffer controller to control the input buffer so that the second data having no identification information among the data stored in the input buffer is supplied to the lossless restorer and the third data and fourth data having the same identification information are combined and supplied to the lossless restorer, and

the lossless encoding and/or decoding system further comprises lossless encoder to losslessly compression encode received other audio data for use in generating another bitstream.

13. The lossless encoding and/or decoding system according to claim 12, wherein the bitrate controller determines the maximum bitrate based upon a bitrate resulting from the lossless compression encoding of all of an amount of the input audio data on an audio track of a recording medium.

14. The lossless encoding and/or decoding system according to claim 12, wherein the first output buffer sequentially outputs the encoded audio data stored according to the bitrate controller at an output bitrate which is less than or equal to the maximum bitrate.

15. The lossless encoding and/or decoding system according to claim 12, wherein the predetermined data units are frames, and the bitrate controller adds the fourth data of a first one of the frames to a second frame of the second data preceding the first frame of the fourth data.

16. The lossless encoding and/or decoding system according to claim 15, wherein the bitrate controller determines whether the fourth data of the first frame and the second data of the second frame combined exceeds the maximum bitrate prior to adding the fourth data of the first frame with the second data of the second frame.

17. The lossless encoding and/or decoding system according to claim 1, wherein the lossless encoding and/or decoding system converts received audio data into the encoded audio data and converts received encoded audio data into the audio data.